

of ozone. Further, gaseous ions exhibit no power to constitute condensation nuclei, so that ionization of the air by either radioactive substances or Röntgen rays has not been shown to be a necessary or sufficient cause for the condensation of supersaturated aqueous vapor.

Trees, especially tall ones and those rich in resins, give rise to ozone, and should therefore favor production of rain. Opinions on the actual influence exerted by trees are, however, very variable.—*T. H. P[ope]*.

EVAPORATION OF MERCURY DROPLETS SUSPENDED IN A GAS.¹

By A. SCHIDLOF & A. KARPOWICZ.

[Reprinted from Science Abstracts, Sect. A, Sept. 23, 1914, § 1569.]

The authors have previously experienced difficulty with experiments as to the value of the electron charge from the motion of mercury droplets between the plates of a condenser, in that the speeds of these drops become less with increase of time under given fields. They have now tried nitrogen as well as air between the condenser plates and extended the time to over an hour. The speed-time graphs slope down in the same way for each gas, the speeds becoming less and less as time goes on. The reductions in an hour's time are to about $\frac{1}{2}$ in the case of air and to about $\frac{1}{3}$ for nitrogen. It is also noticed that the droplets become more difficult to see as the experiments proceed. The conclusion adopted is that the droplets of mercury suffer evaporation under the action of the light.—*E. H. B[arton]*.

EVAPORATION AND ADSORPTION.²

By A. SCHIDLOF.

[Reprinted from Science Abstracts, Sect. A, July 30, 1917, § 578.]

Gives a theory of the phenomena of continuous variation of the mass and of the density of drops of mercury maintained in suspension in a gas.

The hypothesis of molecular bombardment leads to the supposition of a film or layer of adsorption covering the surface of a liquid which is in the presence of a gas. The supposition of this layer of adsorption, combined with that of the molecular bombardment, suffices to explain the whole of the facts observed by A. Targonski.—*E. H. B[arton]*.

DYNAMICS OF REVOLVING FLUIDS.³

551.51/ By LORD RAYLEIGH.

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Meteorology depends ultimately so greatly on the mechanics of revolving fluids that the clear formulation of such simple conclusions as are within reach may be expected to guide the judgment when exact analysis seems impracticable. Aitken's recent paper on "The dynamics of cyclones and anticyclones" is taken as the starting point of the present inquiry, although the present author dissents in some respects from Aitken's views. The condition of symmetry round an axis is here imposed throughout, so that the fundamental equations are most appro-

priately expressed in terms of cylindrical coordinates, r, θ, z , the velocities u, v, w , being measured in the directions in which these increase. It is then shown that rv may be considered to move with the liquid, in accordance with Kelvin's general theorem respecting "circulation," provided that where V is the potential of extraneous forces, $P \equiv \int \rho dr - V$, be independent of θ , which will be the case if ρ be constant or a known function of p , and P be single valued. The motion u, w , will then be the same as for $v = 0$, provided we introduce a force v^2/r along r .

Case $u = w = 0$.—Let gravity act parallel to z (measured downward) on a gas following Boyle's law. Then at a constant level p diminishes inward. But the resulting rarefaction will not cause ascent, inflow of the heavier part outside being prevented by the centrifugal force. The equilibrium of fluid revolving one way round in cylindrical layers between coaxial cylindrical walls will be stable only if the circulation increases with r , and neutral for the circulation constant. With a viscous fluid the stability will be unimpaired by rotation of the outer cylinder, but destroyed by rotation of the inner one. This does not conflict with Kelvin's condition of minimum energy that vorticity must increase outward ("Collected Papers," v. 4, p. 175), for he supposed operations on the boundary changing the moment of momentum, which is here constant. On the other hand, he maintains the strictly two-dimensional character of the admissible variations. But the passage from one two-dimensional state to another may be effected by variations which are not two-dimensional. Of course transition from unstable to permanent stable equilibrium is impossible without dissipative forces, as in the case of a heterogeneous liquid under gravity. But ordinary viscosity does not meet the requirements here considered, as it would interfere with the constancy of circulation. For purely theoretical purposes, however, there is no inconsistency in supposing the u, w , motion resisted while the v motion is unresisted.

Case $u = f(r, t)$, $w = 0$ or finite constant.—Then P is independent of z , and the pressure is determined by the equation,

$$du/dt + udu/dr = -v^2/r - \rho dP/dr.$$

For an incompressible liquid r is determined by the equation of continuity $ur = \phi(t)$, and when u and the initial conditions are known, v follows. The motion, now two-dimensional, is conveniently expressed in terms of the vorticity, which moves with the fluid, and the stream function. For the former initially, and therefore permanently, constant throughout the fluid, the appropriate solution shows that if centrally the motion be one of pure rotation, as of a solid, the outer wall will close in, and, in addition to the pure rotation, the fluid will acquire the motion of a simple vortex of intensity, increasing as the radius of the outer wall diminishes. If the fluid be contained between two coaxial cylinders, both walls must move inward together, and the process will end when the inner wall reaches the axis; but the inner wall, or both, may be dispensed with, and the inflow at $r = r_1$ be supposed removed. It will then remain true that, if it thus pass at a constant pressure, the pressure at $r = r_1$, must continually increase. If a limiting pressure be reached, the inward flow must cease. Calculation of any more general case does not seem practicable, but it can be seen that when the u, w motion is slow relatively to the v motion a kind of equilibrium theory is approximately applicable, much as when the slow motion under gravity of a

¹ Comptes Rendus, Paris, June 29, 1914, 158: 1992-1994.

² Archives des Sciences, —, Mar., 1917, 43:217-244.

³ Proceedings, Roy. Soc., London, Mar. 1, 1917, 93:148-154.

variably dense liquid retains approximately its horizontal stratification; e. g., oil standing over water can be siphoned off without much disturbing the water. When the density varies continuously, the siphon would tend to draw from the horizontal stratum at which it opens; or if the liquid escapes slowly through an aperture in the bottom of the containing vessel only the lower strata are disturbed. So when the revolving fluid is drawn off near a point on the rotation axis the surfaces of constant circulation tend to remain cylindrical, and the more decidedly the faster the rotation. The escaping liquid is drawn always from along the axis, and not symmetrically in all directions, as when there is no rotation. The stability of fluid motion in cylindrical strata requires only an increase outward in the square of the circulation; but if the latter be in both directions this involves discontinuities and for stability rigid symmetry with respect to the axis. Without this limitation the motion will be unstable, so that stability really requires circulation in one direction only. The general question of two-dimensional motion of liquids between fixed coaxial cylindrical walls has been treated by the author in a former paper ("Scientific Papers," v. 1, p. 487), and it may be shown, as on the lines of the demonstration there given for plane strata, that the motion in cylindrical strata is stable provided that the rotation either continually increases or continually decreases in passing outward from the axis.—*G. W. de T[unzelmann]*.

Henry B. Scudder, 1844-1917.

By G. N. SALISBURY, Meteorologist and Section Director.

[Weather Bureau Office, Seattle, Wash., Sept. 12, 1917.]

Mr. Henry B. Scudder, cooperative observer of the Weather Bureau at Moxee near North Yakima, Wash., died at his home in Moxee on July 20, 1917. The Moxee cooperative station was under his direction from March 11, 1892, until the date of his death. His record was

without interruption for a period of 25 years 4 months, making it the longest individual cooperative record kept in the State of Washington.

He was born in Brookline, Mass., June 18, 1844. He was a student at Williams College, when, at the outbreak of the Civil War, he enlisted as a private in the Forty-fifth Massachusetts Regiment. He moved to North Yakima, Wash., in 1888, and settled with his family on his Moxee ranch. He was actively interested in the development of the Yakima Valley, assisting in the organization of several of the first large irrigation enterprises, and helped toward bringing about Government reclamation work in the valley. He brought from the East the first registered Holstein cattle in the valley. For many years he was one of the heaviest hop growers in the valley, and spent much time and interest to better that branch of farming. He built the first silo in his part of the State. For 27 years he was a director of the First National Bank of North Yakima, and was the oldest real estate and insurance operator in the city, maintaining his business uninterruptedly for about 28 years.

A long record with the same exposure, and so far as possible with the same instruments and by the same observer, is the prime fundamental requisite for reliable knowledge of the climate of any section of the globe lying outside the Tropics. Those who secure to us such records deserve to be enrolled on the list of honor in climatology and science, and it is a pleasure to us all to record the above tribute to Mr. Scudder. Our satisfaction is heightened by a communication which states that Miss Alice B. Scudder, daughter of the deceased, has volunteered to continue the excellent record already secured. We may thus justly expect to secure, eventually, another specially long and notably homogeneous record whose observers will be listed with the other honorable names found in the list "Distinguished Cooperative Observers" (MONTHLY WEATHER REVIEW, June, 1907, 35:277-278).—C. A. jr.